THE POTENTIALITY OF THE EMBRYO AND THE SOMATIC CELL

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Abstract: Recent arguments on the ethics of stem cell research have taken a novel approach to the question of the moral status of the embryo. One influential argument focuses on a property that the embryo is said to possess—namely, the property of being an entity with a rational nature or, less controversially, an entity that has the *potential* to acquire a rational nature—and claims that this property is also possessed by a somatic cell. Since nobody seriously thinks that we have a duty to preserve the countless such cells we wash off our body every day in the shower, the argument is intended as a reductio ad absurdum of the claim that the embryo should be afforded the same moral status as a fully developed human being. This article argues that this argument is not successful and that it consequently plays into the hands of those who oppose embryonic stem cell research. It is therefore better to abandon this argument and focus instead on the different argument that potentiality, as such, is not a sufficient ground for the creation of moral obligations towards the embryo.

Keywords: bioethics, embryo, extrinsic potentiality, inner power, intrinsic potentiality, moral status of the embryo, potential, potential person, rationality, rational nature, somatic cell, somatic cell nuclear transfer, stem cell, stem cell research.

1. Introduction

Recent arguments on the ethics of stem cell research have taken a novel approach to the question of the moral status of the embryo. One influential argument focuses on a property that the embryo is said to possess—namely, the property of being an entity with a rational nature or, less controversially, an entity that has the *potential* to acquire a rational nature—and claims that this property is also possessed by a somatic cell (Sagan and Singer 2007). Since nobody seriously thinks that we have a duty to preserve the countless such cells we wash off our body every day in the shower, the argument is intended as a reductio ad absurdum of the claim that the embryo should be afforded the same moral status as a fully developed human being.[1] In this article, I

[1] The example of skin cells sloughed off in the shower comes from Bailey 2001.

argue that this argument is not successful and that it consequently plays into the hands of those who oppose embryonic stem cell research. The argument fails because it arises from conceptual confusion about the operation of the concept of potentiality. By exposing that confusion here, my aim is to persuade advocates of the permissibility of stem cell research to abandon the argument. My claim is not that those who advocate the importance of the potentiality of the embryo are correct and that stem cell research should therefore not be permitted. Rather, my claim is that criticism of that position based on arguments about the respective potentialities of the embryo and of the somatic cell is not successful and so does not succeed in refuting the case made by opponents of embryonic stem cell research.

2. If We Call the Embryo a Being with a Rational Nature, Is the Somatic Cell a Being with a Rational Nature?

The concept of potentiality has played a crucial role in arguments about the nature of the embryo, from which conclusions as to its moral status have been derived. The basic use more recently made of this notion is that the embryo is a being with a rational nature because, unlike, say, lizard embryos, the embryo will develop a capacity to exercise that intrinsic rationality (Lee and George 2006; George and Lee 2009a and 2009b; George and Tollefsen 2008, chaps. 1 and 3). This, it has been claimed, gives the embryo a special moral status that justifies ruling out embryonic stem cell research, which would result in the destruction of such embryos (Lee and George 2006; George and Lee 2009a and 2009b; George and Tollefsen 2008, chaps. 1, 3, and 4). It is, of course, possible to question the claim that the embryo *is* a being with a rational nature (Sagan and Singer 2007, 276). One might insist, instead, that it is merely a being with the *potential* to develop a rational nature.[2] Nonetheless, even if this qualification is accepted, one can still say that the embryo "is" a being with a rational nature to the extent that, unlike a lizard embryo, it has the potential to become a fully rational being and, in the absence of any disabling conditions, will go on to develop into such a being. So not much turns on whether we say the embryo *is* a being

[2] A separate controversy is that of the point from which an embryo could be said to have the potential to develop into a being with a rational nature. If we grant that potentiality is significant, does it have that potentiality from conception or from some later time? The possibilities of embryo splitting and twinning might speak against this possibility, but it is outside the scope of this article to enter into that controversy.

with a rational nature or whether we say it is a being with the *potential* to become a being with a rational nature, for on both ways of expressing the point, the embryo can be differentiated from the embryos of lizards. Since the potentiality for rationality is the basis for saying that the embryo "is" an entity with a rational nature, criticisms of this claim by proponents of the permissibility of embryonic stem cell research have tended to focus on the putative significance of the *potentiality* of the embryo.[3]

Agata Sagan and Peter Singer have confronted the argument that the embryo is morally significant by reason of its potentiality to develop into a fully self-conscious rational being (Sagan and Singer 2007). They claim that the same potentiality to develop into a fully self-conscious rational being is possessed by embryonic stem cells and somatic cells, the countless cells we rub off our bodies in the shower every morning. It is the claim about the somatic cell that I focus upon in what follows.[4] With this point, Sagan and Singer develop an argument that was first advanced by Ronald Bailey, who stated: "Each skin cell, each neuron, each liver cell, is *potentially* a person. All that's lacking is the will and the application of the appropriate technology. Cloning technology like that which famously produced the Scottish sheep Dolly in 1997 could be applied to each of your cells to potentially produce babies" (Bailey 2001). It is essential to note the breadth of this claim. Bailey is speaking not only of adult stem cells but of "*every* cell in your body" (Bailey 2001, emphasis in original).

To develop the argument, Sagan and Singer begin by claiming that the concept of intrinsic potentiality, as used by opponents of embryonic stem cell research, is problematic and that it is not clear, on its current use, that we can meaningfully refer to anything like the intrinsic potentiality of the embryo to develop into a mature adult. They then claim that, even if the concept were not problematic, it would apply to the

[3] Sagan and Singer (2007, 275) note that the concept of "development" on which Lee and George rely to support the claim that the embryo *is* an individual with a rational nature is not sufficiently distinct from the concept of potentiality.

[4] Having noted that the potentiality is also possessed by an embryonic stem cell, Sagan and Singer (2007, 269) imagine provisionally evaluating different kinds of cells on the basis of their ability to develop to maturity, with adult stem cells ranked below embryonic stem cells but above somatic cells. But, as we shall see, they expressly disavow any significant difference between the potentiality of the somatic cell and that of other cells. Furthermore, with respect to the embryonic stem cell, it should be noted that its potentiality comes too late for the purposes of the embryonic stem cell debate, because it has that potential only if embryonic stem cell harvesting is permitted, yet whether such harvesting should be permitted is the very issue being debated. For other arguments against Sagan and Singer's position on the embryonic stem cell, see George and Lee 2009a.

somatic cell just as much as to the embryo. I shall examine each of these arguments in turn.

2.1. Does the Embryo Really Have the Intrinsic Potential to Develop into a Mature Adult Human Being?

2.1.1. Intrinsic Potentiality and Enabling Conditions or Disabling Conditions

Sagan and Singer focus initially on the concept of intrinsic potentiality to support their argument: "[Lee and George] appeal to a special sense of potentiality—parsed as 'active disposition or intrinsic power'—to distinguish the embryo from the somatic cell" (Sagan and Singer 2007, 273).[5] Yet the concept of intrinsic potentiality is, they say, problematic because it seems to exclude factors that are relevant to whether, in a particular case, we can say that the being in question really has such a potential or not.

Sagan and Singer begin the argument by discussing the case of embryos produced by in vitro fertilization (IVF). These are the embryos that would be used by scientists to obtain embryonic stem cells. Sagan and Singer deny that we can say of IVF embryos that they have an intrinsic potential to develop into mature human beings, on the basis that "very few of them will have the chance to develop into mature human beings" (2007, 274). This is because most of these embryos are surplus

[5] Note, however, that having acknowledged in this passage that Lee and George use intrinsic power to distinguish the embryo from the *somatic* cell, Sagan and Singer (2007, 274) deny there is a "sharp distinction" between the embryo and the *stem* cell. The use of the term "stem cell" here is intriguing, because it is broad enough to cover embryonic stem cells, some somatic cells that are adult stem cells (though of course the *adult* stem cell is not totipotent), and *reprogrammed* somatic cells—that is, somatic cells that are not stem cells until they have been reprogrammed in the egg (or with induced pluripotent cells, in the lab)—and so the term "stem cell" is ambiguous. But in the passage Sagan and Singer are criticising, Lee and George are expressly dealing with the potentiality of the *somatic* cell before any manipulation or reprogramming, and Sagan and Singer acknowledge this when beginning their argument by stating that there is "a more fundamental problem with the basic argument Lee and George present, even as applied to *somatic* cells" (2007, 273, emphasis added) and referring to "their argument that the potential of the embryo is different from the potential of the *somatic* cell" (275, emphasis added). This means that it is essential, when assessing the concept of intrinsic power, to be clear about what entity we are dealing with. Sagan and Singer's glide from the use of "somatic cell" to the use of the ambiguous term "stem cell" perhaps betrays the difficulty they have in maintaining the argument in the case of the somatic cell, where that term refers to all cells in my body except germ cells. To successfully challenge Lee and George's argument about the difference between the embryo and the somatic cell, however, Sagan and Singer must of course claim that the somatic cell—that is, any cell except a germ cell—itself has the same intrinsic power Lee and George attribute to the embryo.

and thus unwanted by the mother to whom they are genetically related. For such embryos to develop into maturity, it would be necessary to find a woman willing to have the genetically unrelated embryos implanted into her, and then have scientists carefully thaw the embryo and transfer it to the woman's uterus. Yet "there are hundreds of thousands of them" (274). This difficulty leads Sagan and Singer to make the following assertion: "The 'intrinsic power' of the embryo in these circumstances is impotent—*in other words, there is no such power*" (274, emphasis added).

The point here is that because there are hundreds of thousands of these embryos, the vast majority of them are not going to be implanted, and so will not develop into mature human beings. And any that are implanted in any case need the assistance of technology. To speak of their "intrinsic potentiality" to develop into mature human beings is therefore confused: they do not *have* such an intrinsic potentiality. They would only have such a potentiality if they were implanted. One might object that this point is question begging, because the existence of frozen embryos outside the womb has created this situation and so cannot be used to assess the intrinsic power of the embryos in a more natural situation. Sagan and Singer anticipate this objection, however, and respond by claiming that there is nothing unusual about natural embryos failing to implant and being flushed out of the uterus (2007, 274). They therefore turn, by anticipating this objection, to the case of natural embryos.

The natural embryo, they say, is not in a position different from that of the surplus IVF embryo. Just as an IVF embryo requires a suitable environment—a woman willing to accept into her body an embryo that is not genetically related to her—so a naturally produced embryo must likewise find its way to a suitable environment, namely, the womb. But its successful implantation in the womb is not a foregone conclusion at all. It is therefore misleading to refer to its intrinsic potentiality.[6] And for the same reason, they suggest, there is no "sharp distinction" between the so-called intrinsic power of the embryo and the power of the somatic cell

[6] Note, however, that their attempt to answer this objection may be weakened by their own concession that "about 30 percent spontaneously miscarry" (Sagan and Singer 2007, 272). If this figure is correct, one could not say in the case of embryos created naturally that the vast majority of them will fail to develop to maturity, and this would frustrate the parallel they purport to draw between IVF and natural embryos. However, Douglas and Savulescu (2009, 308), relying on different scientists, have stated that "more than 50% of embryos die within eight weeks of conception." If this figure is correct, Sagan and Singer's parallel could be drawn. But for reasons we will now see, it would not show that referring to the intrinsic potential of the embryo to develop to maturity is problematic.

to develop to maturity. For in each case what determines whether the entity has the power or not to develop to maturity are the *circumstances*, and whether these are favourable or not (Sagan and Singer 2007, 276).[7] And given our abilities to control and manipulate those circumstances, we can make it the case that a somatic cell, just as much as an embryo, can develop into an adult human being. This possibility therefore seems to reduce any difference between the potentiality of the embryo, on the one hand, and the potentiality of the somatic cell, on the other, and so makes it problematic to try to distinguish the embryo from the somatic cell by appealing to the notion of intrinsic potentiality. Katrien Devolder and John Harris make a similar point: "*Defining* potentiality as an *all-or-nothing* matter *solely* dependent on an entity's inherent dynamic to become a human ignores the immense importance of diverse external factors that play a role in the actualisation of this potential" (Devolder and Harris 2007, 158, emphases added).

I acknowledge, of course, that "external" factors play a role in the development of the embryo. But these are enabling conditions that allow the intrinsic potentiality of the embryo to actualise itself. For this reason—contrary to what is suggested by Devolder and Harris and, as we have seen, by Sagan and Singer—these external factors should *not* be included in the *definition* of potentiality, as though that definition, as currently used when referring to the intrinsic dynamic of an entity, were incomplete for failing to mention those enabling conditions. The enabling conditions are the background conditions that we take for granted when we refer to anything like the intrinsic potential of an entity, and so do not form part of what we mean when we speak of an entity's "intrinsic potentiality." While true, it is no qualification to the statement that a car "can" do 100 m.p.h. that it must nonetheless have fuel in the tank,[8] as though the statement is somehow incomplete or inaccurate without the qualification. When referring to that potential, the circumstances in which such a potential must unfold are already taken as given.[9] But by claiming that in the case of

[7] On whether a child was ever a somatic cell, see Sagan and Singer (2007, 273) and their analogy with the pelargonium.

[8] This example is taken from Hacker 2007, 94.

[9] This point explains away an apparent inconsistency that Sagan and Singer appear to identify in our definition of the term "embryo." Noting that "the very concept of something being an 'embryo' suggests that it has the capacity to, or is likely to develop into some more mature stage," they remark that the term is also applied to entities that, owing to some defect or accident, "have no possibility of developing to maturity" (Sagan and Singer 2007, 266). As I shall explain, disabling conditions or the

both natural and IVF embryos the vast amount of wasted embryos means that there is no such "inner power" of the embryo to develop into a human being, Sagan and Singer conflate the intrinsic power of the embryo with the conditions necessary for that power to become actualised.[10]

But could Sagan and Singer retort that if the conditions are not satisfied, then the embryo simply does not *have* the relevant potential? We need to distinguish different cases here. In the case of the IVF embryos, for instance, we do not know in advance which embryos are going to be implanted and which are not, so we simply cannot say on anything more than a general level whether the enabling conditions for the actualisation of their potential are going to be satisfied or not. That means that we cannot say of any particular embryo in advance that it does not have the potential to develop into a mature human being. On the contrary, we say that every such embryo, by virtue of being an embryo, has the potential to become a mature human being, unless the enabling conditions for the actualisation of that potential are absent or disabling conditions are present.[11] Sagan and Singer, by contrast, effectively want to say: every such embryo *only* has the potential to become a mature human being *if* the enabling conditions are satisfied or disabling conditions are absent. But the difficulty with this formulation is that it dispenses with potentiality altogether. For we can only *know* if the conditions are satisfied once the potential has been fulfilled, but at that stage we are dealing with an actuality, not a potentiality. The very idea of potentiality requires a judgement in advance of its fulfilment, but if we say embryos only have the relevant potential *if* the enabling conditions are satisfied, it would be premature to make any statement about potentiality in advance of the satisfaction of those conditions, yet once the conditions are satisfied it is already too late to speak of potentiality.

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absence of enabling conditions account for why we still apply the term "embryo" to these entities even though the very concept of an embryo suggests the capacity to develop to maturity.

[10] In section 2.2 we shall see why there remains a difference between the potentiality of the embryo and that of the somatic cell. For the moment, I only wish to clarify the concept of intrinsic potentiality by differentiating it from the enabling conditions of its realisation.

[11] In the case of leftover IVF embryos donated for the purposes of stem cell research, we do know that these embryos will not be implanted (unless a genetically unrelated willing mother is found), but for reasons I shall now explain, what it means to say of such embryos that they do not have the potential to develop into rational creatures differs from what it means to say the same thing of a lizard embryo. Strictly speaking, the embryos have the potential to develop rationality, but enabling conditions are not present to facilitate this and only in *that* sense do they lack the requisite potential. This point is explained in detail in the text.

On the other hand, once we know in a particular case that the enabling conditions are permanently absent or disabling conditions are permanently present, we can say that *this* embryo will not develop into a mature human being (and so does not have the potential so to develop).[12] But what is meant by saying in such a case that the embryo will not develop into a mature human being (and therefore that it does not have the potential to develop into maturity) is precisely that one of the enabling conditions necessary for it to do so is absent (or disabling conditions are present), not that it is not the kind of being that develops into a mature human being. This is unlike saying that a lizard does not have the potential to fly or to speak several languages. In a given case, we do not think that anything has gone wrong when, referring to a particular lizard, we recognise that it will never fly. Enabling or disabling conditions simply do not enter into the equation at all in respect of such a lack of potential. By contrast, if a particular human embryo has been permanently damaged, we recognise that something has gone wrong, and we differentiate the case of the human embryo from the case of the lizard embryo precisely by recognising that what prevents the intrinsic potentiality of the human embryo from developing rationality (and so what it means to say of such an embryo that it does not have such potential) is the presence of disabling conditions. And if instead of permanent damage we are concerned only with a particular IVF embryo that will not be implanted, then enabling conditions are not present and the absence of these conditions permanently prevents it from actualising the potential that it has—and in that sense we can say that it does not have the potential *provided* we realise that we are in such a case *only* referring to the absence of the conditions necessary for that potential to become actualised.

Whether the fact that enabling conditions are absent or disabling conditions are present means that such an embryo has lost any moral status claimed for it is, of course, a separate question. The point, for now, is simply that what it means to say of a lizard embryo and a human embryo that neither has the potential to develop rationality is different in each case. In the case of the lizard, it means that it simply has no potential, in virtue of the kind of being that it is, to develop rationality. In the case of a human embryo, by contrast, it has no potentiality either because of some permanent defect (by reason of what I am calling the presence of disabling conditions,

[12] Enabling conditions might be the presence of a suitable environment for the development of the embryo, such as a womb. Disabling conditions, by contrast, might be the presence of a defect in the embryo that prevents it from developing to maturity. Examples of the latter are discussed below.

making it a permanently defective embryo) or because it will not be in the right environment (by reason of the absence of enabling conditions).[13] The case of the somatic cell is more like the case of the lizard embryo because when we rub off our skin cells in the shower and they fail to develop into embryos, this is not because anything has gone wrong, as though disabling conditions have prevented them from becoming mature adult human beings, or because they have not found their way to a suitable environment. The somatic cells in their mature form do not have an intrinsic potential to self-develop into an adult human being, because the cells have become specialised to fulfil the different functions that natural selection has programmed them to fulfil.[14] They merely have the *extrinsic* potential to develop into an adult human being, that is, through scientific intervention involving the application of technology to confer on to them properties that they do not currently possess. I return to extrinsic potentiality in section 2.2.

At one stage in their article, Sagan and Singer invite us to consider the case of a defective embryo for which we had the means to remedy the genetic defect and make the embryo normal. Such a case would be one in which the potential remains because the damage is only *temporary*. In this case, they claim, "it would still be the case that the embryo's power to develop was not 'intrinsic' to it, and it was unable to 'self-develop'" (Sagan and Singer 2007, 276). They could therefore argue that if, as I am suggesting, we say merely that the presence of the defect is a disabling condition, we seem to be implying that it has an intrinsic potentiality locked within it, and that this has been somehow disabled or deactivated. But if the defect is there from the very beginning, it is surely more accurate to say that this particular embryo simply does not, and never did have, an "intrinsic" potentiality to self-develop—until the remedial action to make it normal is taken. Only the remedial action would give it this potentiality—but it would be extrinsic, not intrinsic. But if I conceded that this is more accurate, they could then argue that this concession would mean that the defective but remediable embryo is in the position of a somatic cell, which also needs

[13] Could it be said that the permanently defective embryo is in exactly the same position as entities that do not have the potential as a matter of their species nature? There is no harm in saying so, provided that the differences are not thereby concealed: in the case of the lizard embryo that has no such potential by means of its species nature, the lizard is not *lacking* anything it would normally have, and that is why it makes no sense to regard the absence of a potential for rationality as a *defect*. Not so in the case of the human embryo.

[14] I discuss the relevance of the possibility of *reprogramming* the cells, and the implications this has for the concept of intrinsic potentiality, in section 2.2.

action to be taken for it to develop into a human being. Alternatively, if on my account we say that it *did* have the potential from the beginning, and that its possessing that potential is the very thing that makes it possible to remedy the defect and make the embryo normal, why are we not forced on my account to say precisely the same thing of the somatic cell? Such an embryo is surely akin to a somatic cell, so the argument runs, for in both cases external technological intervention is capable of giving both these entities the "potential" to develop into adult human beings.

The difficulty with this analysis, however, is that it again fails to account for the difference between a *defective* entity, on the one hand, and a normal, non-defective entity (that can be altered via the application of technology), on the other. We understand the nature of an entity partly by reference to what it has been designed by natural selection to do, and it is by taking into account its function or role that we are able to identify certain differences precisely as *defects*. A hand that cannot clasp is defective because a significant function of the hand is to clasp objects. It is against our understanding of what the hand is for that we are able to call an inability to clasp a defect or disability of some kind and, where possible, seek to "remedy" it. In saying that the hand "cannot clasp" it is more accurate to say that a disabling condition or a defect has prevented the hand from developing in such a way as to fulfil the function it was designed by natural selection to do.[15] The word "intrinsic" in "intrinsic potentiality" is misleading because it implies the presence of some mysterious power in the entity in question that remains somehow locked away and therefore incapable of expressing itself, whereas it is merely a way of referring to what the entity has been designed by natural selection to do, what it does, or is for, once it reaches maturity. And a fully functioning human embryo develops into a mature human being. That in some cases external intervention may be required to remedy a defect so as to enable it to fulfil its potential does not make it analogous to the somatic cell, for the somatic cell such as a skin cell has developed to fulfil the function of forming the skin of the adult human being, and its fulfilling that function is no defect on its part. Any potential it now has *in its mature form* to fulfil a *different* function is, for that very reason, extrinsic rather than intrinsic to it, and so action taken to fulfil any such

[15] No religious or metaphysical presuppositions should be read into this talk of "design" in the case of natural selection. It is well recognised that no bogus metaphysical teleology need be implied by this talk of natural selection and the function of various organs. For detailed discussion of these issues, and the continued relevance of teleological concepts in science, see Hacker 2007, chap. 6.

extrinsic potential cannot be described as *remedial*. It is for this reason that we mark the difference between an entity that is defective (and so cannot become what it is designed by natural selection to become) and one that is not by reference to the distinction between intrinsic and extrinsic potentiality. In a case such as that envisaged by Sagan and Singer where the defect in a human embryo can actually be remedied, the intrinsic potential has not been lost or transformed into merely an extrinsic potential;[16] since the defect can be remedied, the entity still has the intrinsic potential it has when it is not defective. It is just that the disabling conditions that currently prevent it from fulfilling that potential need to be removed. We can say that the embryo has the intrinsic potentiality to develop rationality in this case, even though external intervention to remedy the defect is required, because the defect can be removed. It is therefore better to understand the defect as a disabling condition so as to differentiate it from the kind of activity involved when transforming the somatic cell into an embryo. In the latter case, the transformation changes the nature of the entity (from a skin cell to a reprogrammed stem cell) and in no way removes a defect.

Sagan and Singer might respond to this contention by claiming that the human somatic cell is in exactly the same position as the human embryo in that the human cell contains the human DNA necessary to produce a mature human being. It should be noted, however, that containing that human DNA is not sufficient to refute the above defence of the distinction between intrinsic potentiality and the conditions necessary for its fulfilment, and between intrinsic and extrinsic potentiality: for in the case of the lizard embryo, there is no *extrinsic* potential to become an adult human being, still less an intrinsic potential to become an adult human being. It is the presence of human DNA in human somatic cells that allows us to say that the somatic cell has the extrinsic potential to develop into a mature human being. But if that DNA allowed us to say that the somatic cell has the *intrinsic* (rather than extrinsic) potential to develop into a mature human being (as has the human embryo even with the temporary defect), it would mean that every somatic cell in your body is actually an embryo and that disabling conditions have prevented it from becoming an adult human being. But it is surely not plausible to consider the specific functions of each organ in the body as the manifestation of a disabling condition preventing every cell

[16] Contra both Sagan and Singer (2007, 2009) and Devolder (2009, 1287), who claims that a damaged but reparable embryo "does not have the intrinsic potential to develop into a [mature] human being."

in your body from having become a mature adult human being. We shall return to the distinction between intrinsic and extrinsic potentiality in more detail in section 2.2.

2.1.2. Should Intrinsic Potentiality Be Defined in Terms of Notions of Probability?

It is noteworthy that, in denying that IVF embryos have the potential to develop into mature adults on the basis that the "vast majority" of these embryos will not be implanted, Sagan and Singer's arguments are tantamount to the recommendation of a redefinition of "intrinsic power" to mean that which would become realised in the vast majority of circumstances. We should not, they are effectively saying, refer to the intrinsic potentiality of an embryo to mature into an adult when the vast majority of those embryos will not mature into adults.

But notice how much of our way of categorising the world would change if we adopted the recommendation. When a tree produces far more seed than will actually take root or a frog produces far more spawn than will actually grow into adult frogs, this does not mean that we cannot refer to the intrinsic potentiality in any seed and spawn to become a mature adult in each case. We do not, instead, refer to their intrinsic potential to mature into food on account of the fact that seed and spawn in such cases are more likely to be eaten than they are to mature into adults. Yet on Sagan and Singer's criterion for intrinsic potentiality (as being a result that happens in the vast majority of cases), this is precisely how we ought to talk—we might need to speak of an intrinsic potential to become food rather than an intrinsic potential to develop into maturity. But this is clearly absurd. Indeed, in some species of termites, reproductive termites develop wings that they use to leave the termite mound. Assume that many more termites are eaten than actually take off from the mound. On Sagan and Singer's recommendation, it makes no sense to speak of the termites' intrinsic potential for flight in such a case, *even though they have wings*. On the contrary, they can only fly "in favourable circumstances," those circumstances in this case being the absence of a predator ready to eat them as they emerge from the mound.

But Sagan and Singer have simply conflated potentiality with the enabling conditions for its realisation and the disabling conditions for its nonrealisation when effectively recommending that we refer only to an intrinsic potentiality where that

potentiality can be realised in the vast majority of cases.[17] Accordingly, their case for allowing stem cell research becomes weakened by this confusion, and, once again, they play into the hands of their opponents.

2.2. Does the Somatic Cell Have Exactly the Same Potential to Develop into a Mature Human Being as Does the Embryo?

In section 2.1, I focused primarily on the concept of intrinsic potentiality, and, in particular, on the difference between intrinsic potentiality and the enabling conditions for its realisation, or the disabling conditions for its realisation. It is, I have contended, Sagan and Singer's failure to appreciate the distinction between intrinsic potentiality and the enabling or disabling conditions for its realisation that has led them to question Lee and George's appeal to intrinsic potentiality as a ground for distinguishing the embryo from the somatic cell. Sagan and Singer might concede this point but might still deny that there is a difference in the respective potentialities of the embryo and the somatic cell, insisting instead that any difference that existed between the potentialities of these entities would only concern a difference in what I have called the enabling conditions of its realisation. I touched briefly on this issue in section 2.1 at various points. I briefly examined, for example, one version of this claim, where Sagan and Singer suggest that a defective embryo whose defect could be remedied with the application of technology might be in the same position as a somatic cell that, with the application of technology, could become an adult human being. And I have also briefly presented their more general argument that the non-defective embryo and the somatic cell both have the potential to become an adult human being, it being the circumstances, and whether these are favourable, that determine whether the embryo and the somatic cell can develop into a mature human being. I shall now give this more general argument some further attention, focusing on the concept of *extrinsic* potentiality, and its distinction from intrinsic potentiality,

[17] Note that there is nothing wrong, per se, in recommending that concepts be redefined (thanks to Dominic Wilkinson for prompting me to clarify this point). The point is that the recommendation must not stem from confusion, and arguably it does in this case. Also, once it is admitted that a recommendation is being made that a distinction be abandoned or a concept be redefined, then it is clear that the recommendation is being made for the moral purposes they seek to advance, rather than reflecting a priorly existing concept or distinction *already having* moral relevance. It is difficult not to see some circularity in attempting to derive moral conclusions from the recommendation.

as the key factor that distinguishes the somatic cell from the embryo. I shall then examine a possible objection to my alternative account raised by Julian Savulescu.

Building on the work of Bailey, who claims that "[e]ach skin cell, each neuron, each liver cell, is *potentially* a person" (Bailey 2001), Sagan and Singer suggest that if we regard the embryo as having an intrinsic power to develop into a human being, then the same power is possessed by the somatic cell. We should therefore regard both entities as equivalent, morally speaking. They write: "If something can develop into a new human being, should we think of it as having the moral status of the embryo? If what is important is that an entity can become an adult human being, then should not that entity have the same status as an embryo that can develop into a mature human being?" (Sagan and Singer 2007, 269). This argument seems compelling only by either ignoring or rejecting the distinction between the "intrinsic" potentiality of the embryo and the "extrinsic" potentiality of the somatic cell: "Lee and George reject the idea that a somatic cell—in contrast to an embryo—could be 'a distinct individual with a rational nature.' But if having the genetic coding to develop, under favourable circumstances, into a being with a rational nature is crucial to the wrongness of killing, then our earlier account of the different entities that can become a human embryo shows that some unusual entities have this property" (Sagan and Singer 2007, 276). Here, Sagan and Singer seem to be saying that having the genetic coding to develop, under favourable circumstances, into a being with a rational nature is true both of the embryo and of the somatic cell, and so their potentiality is the same. For Sagan and Singer, then, the somatic cell possesses the potential to become a human embryo and so would, if potentiality really is as significant as Lee and George have claimed, have to be afforded equivalent moral protection. This is intended as a reductio ad absurdum of Lee and George's position. As Savulescu succinctly puts it: "If all our cells could be persons, then we cannot appeal to the fact that an embryo could be a person to justify the special treatment we give it" (1999, 91).

As already noted in section 2.1, however, possession of DNA, the genetic coding necessary to create a human being, is sufficient not for intrinsic but merely for extrinsic potentiality. For when a cell possessing the DNA of a human develops into a different entity, say, a skin cell, rather than an adult human being, this is not because a disabling condition has prevented the cell from developing into a mature human being but rather because natural selection has caused the cell to develop to fulfil one of the

multifarious other functions it must fulfil (for example, becoming a skin cell) in order for a fully fledged human being to come to exist. For this reason, the word "can" as used in "if something can develop into an embryo" (as with the word "potentially" in the passage from Bailey and the word "could" in the passage from Savulescu) is ambiguous and conceals a distinction that, for some, has an important moral relevance. There is, of course, more than one way in which "something can develop into a new human being," and the meaning of the word "can" will depend on what entity the word "something" is referring to. For example, if by "something" is meant a somatic cell, then it is only *technically* possible for that entity to develop into a human being. Assuming that such a possibility is real—an assumption we can make for the sake of argument—a considerable degree of technological intervention is required for this to happen, and the application of that technology, if successful, results in an entity that fulfils a purpose or function completely different from that which it is currently fulfilling. For this reason, its potentiality is extrinsic, not intrinsic. A somatic cell such as a skin cell must, by human intervention, be removed from the body and, by sophisticated technological intervention, have its nucleus placed into an enucleated egg, and then have an electrical current applied to it by appropriately qualified experts, so that the cell is reprogrammed to become totipotent. By contrast, in the case of an embryo produced naturally, the possibility with which we are concerned is not a technical possibility. It is a power intrinsic to the embryo itself. It is simply not plausible to try to reduce the difference between the somatic cell and the natural embryo by categorising the application of these sophisticated technological techniques as merely "favourable circumstances." If it were otherwise, we would really be debating the question of whether we had discovered new embryos. But in the case of the somatic cell, that is not how the debate proceeds.

Sagan and Singer would nonetheless insist that the difference here is a difference of degree, not a difference in kind. Anticipating, in a later letter, the point that, "when reprogramming cells, the new being comes into existence only when the reprogramming is complete," they write: "But such a response would miss the point that the potential was there before the cells were reprogrammed" (Sagan and Singer 2009, 1283). But here they are clearly overlooking the distinction between intrinsic and extrinsic potentiality in making this claim. The level of artificial intervention required, and the fact that such intervention would appropriate the somatic cell for a different function, makes the somatic cell different from an embryo. It cannot

genuinely be said that the somatic cell has the intrinsic potential to develop into a mature human being. Indeed, if it could be, that would be a reason for stating that we have discovered new embryos. But this is a conclusion that neither author countenances. Sagan and Singer rightly stop short of claiming that we have discovered that the somatic cell is in fact an embryo. Yet they expressly concede that the intrinsic potential to develop into a mature being is part of "the very concept of being 'an embryo'" (Sagan and Singer 2007, 266). It would follow from this concession that somatic cells—indeed, all cells hitherto discovered and undiscovered having the "potential" to develop into a mature human being—are embryos.[18] But this is, of course, a reductio of Sagan and Singer's view, and it is not surprising that they stop short of drawing the conclusion, even as they put into question the distinction between intrinsic potential and the enabling conditions that allow that potential to unfold. In refraining from drawing the conclusion, they appear to be acknowledging the ambiguity of the word "can" in such statements as "all these entities can develop into human beings" even as they conceal that ambiguity, as they must, in order to deny the moral relevance of the difference. This catches them in a pincer.

But is this too quick? Savulescu claims, for instance, that to say of a somatic cell such as a skin cell before nuclear transfer that it does not have the potential to become a human being is like saying that my car does not have the potential to get me from Melbourne to Sydney unless the key is turned in the ignition (Savulescu 1999, 91). But this, to my mind, is not right. Inserting the key into the ignition can hardly be called a technological intervention that appropriates the car for the fulfilment of a function completely different from that which it currently serves. There are two aspects to this criticism of Savulescu's analogy. First, to equate inserting a key into the ignition, which can be done by any layperson, with sophisticated techniques that can only be carefully undertaken by the appropriate qualified experts misconstrues what is meant by "technological intervention." Plugging an electric kettle into a socket or inserting a key into the ignition, which can be done by laypersons, is not what is meant by "technological intervention." Laypersons are merely making use of the *product* of technology. We must therefore distinguish between the *use of the*

[18] Some writers do not shy away from this conclusion in the context of a biopsied totipotent cell (Devolder and Harris 2007, 155). But the somatic cell is not a totipotent cell; it must first be made into one. And even the totipotent cell must be biopsied and replaced in the uterus for it to turn into an embryo. Prior to this stage, the stem cell is capable of turning into multiple entities.

products of technology—cars, kettles—by laypersons, as when we all place a key in the ignition to drive to work in the morning or plug the kettle into the socket in the wall—and the *application* of technology to *create* those products, as when scientists and experts seek, by the application of technology, to bring something about in a controlled way in a procedure that requires their special expertise and knowledge (building a car, making a kettle, extracting the nucleus of a somatic cell and then modifying the nucleus via the egg, or reprogramming a somatic cell to make it into an induced pluripotent stem cell).[19] The expression "technological intervention" refers to a degree of engineering to produce an entity that can only be undertaken by suitably qualified experts.[20] But Savulescu may nonetheless insist that this difference is merely a matter of degree. This brings me to the second aspect of my criticism of his analogy.

A somatic cell is not, of course, a totipotent stem cell, and the reactivation of genes that would make the cell a stem cell that could produce a kidney is more akin to dismantling a car and using the same components to build a lawnmower. Does that mean the car is potentially a lawnmower? Is the skin cell potentially a kidney? If we answer affirmatively to the latter we must by the same lights answer affirmatively to the former, but in both cases the kind of potentiality concerned is extrinsic, not intrinsic. It is obvious that the potential of the car to drive to Sydney is quite different from its "potential" to be a lawnmower, and the difference resides precisely in the amount of external technological intervention that is required *and* in the change of function or purpose for which the entity is being appropriated, between intrinsic and extrinsic potentiality. Savulescu's comments, then, beg the question, and they amount to no more than stipulating that the two kinds of potentiality (intrinsic, extrinsic) cannot be distinguished.

The true position is, then, that intrinsic power refers to that which would actualise itself in the appropriate circumstances without any artificial or technological intervention (with the exception, as noted above, of intervention to remove a *defect*)—the distinction we have drawn above between technical and natural possibility is all important here. The arguments of Sagan and Singer, Bailey and Savulescu trade, at bottom, simply on the fact that we use the words "potential" and "can" to refer to both

[19] Induced pluripotent stem cell technology was not, of course, known at the time Savulescu made his claim about every cell in our body, but the point still holds in the case of somatic cell nuclear transfer and applies in any event to the more recent views of Sagan and Singer (2009).

[20] On the possible impact for this point of the case of IVF embryos, see text below.

extrinsic and intrinsic potentiality. But their case—dependent as it is on concealing the ambiguity between these two different cases of "can"—collapses once intrinsic and extrinsic potentiality are distinguished.

The contrast that I have been drawing here, and that Sagan and Singer are denying, is that between *natural* embryos and the somatic cell, such as a skin cell that I rub off my body. Are IVF embryos in a different position, closer to the somatic cell? The relevant potential in the case of the IVF embryo is the potential of the embryo, *once created*. I am not committed to denying, here, that *embryos* created via technological intervention have the potential to be human beings. Clearly, an embryo created by somatic cell nuclear transfer , *once created,* has the same potential as an embryo created by natural fertilization, notwithstanding that *some* degree of technological intervention is required to implant the IVF embryo. Once again, Sagan and Singer expressly state that it is the somatic cell *before* reprogramming that has the potential of the embryo, rather than merely the resultant entity following transfer. The difference between a somatic cell rubbed off my body in the shower and an IVF embryo is that the latter has been *created* for the express purpose of transplantation, whereas the cells we rub off our bodies in the shower are not designed by natural selection to become adult human beings—they are specialised cells that must be reprogrammed to attain the position of totipotency or pluripotency. The IVF embryo, once created, needs no further programming and exists as an embryo at that stage. Prior to that, we have only an unfertilised egg. No embryo exists at this point. The unfertilised egg *is* in the position of the somatic cell because it is a different entity that does not of itself possess any intrinsic power to self-develop into a fully rational being.

This latter claim might be contested. It might be argued that the egg is clearly designed by natural selection for fertilisation whereas, on my account, the skin cell is not. Although we could answer this objection by insisting that the egg becomes a different entity—an embryo—on fertilisation, we can also concede the point for the sake of argument. If we concede the point, it still does not affect my analysis, because the egg is then *more like* the embryo than the somatic cell. The point would only affect my argument if the egg were *less* like the embryo than the somatic cell.

Could Sagan and Singer concede all these points but argue that the potentiality of the *reprogrammed cell*, as opposed to the somatic cell *before* reprogramming, is not meaningfully different from that of the embryo? They do indeed advance such an

argument, and Lee and George have responded (Sagan and Singer 2009, George and Lee 2009b; see also Devolder 2009). As noted above, however, Sagan and Singer have also wrongly denied the relevance of the distinction between the cell before reprogramming and the cell after. But, as noted, this distinction is crucial, and even if Sagan and Singer were right about the potentiality of the reprogrammed cell, that argument is considerably less far reaching. Once the distinction between intrinsic and extrinsic potentiality is recognised, the argument about the cell *after* reprogramming would not support the reductio ad absurdum argument advanced by Sagan and Singer, namely, that those who base their objections on the intrinsic potentiality of the embryo would be committed to advocating the protection of all the cells in our body, including the skin cells we rub off our bodies every day in the shower. Rather, the argument about the *reprogrammed* cell concerns only our responsibilities to an entity that has already been manipulated by means of technological techniques, thereby producing an entity with powers considerably different from those of the entity existing prior to the reprogramming. My aim in this article, however, has been to highlight the flaws in the more radical argument that they develop, following Bailey and endorsed by Savulescu, about our cells *before* any such reprogramming.

3. Conclusion

The conceptual confusions I have identified in this article present a problem for Sagan and Singer to the extent that they build their case for the moral permissibility of stem cell research on many of the claims we have found to be suspect. That being so, they play into the hands of their opponents, undermining their important case for the moral permissibility of stem cell research. It is better, I think, to argue simply that intrinsic potentiality itself is not a sufficient criterion for the creation of moral obligations; but that is an argument that is beyond the scope of this article.

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Acknowledgments

Thanks to an anonymous reviewer at *Metaphilosophy* for helpful comments. Thanks also to Gabrielle Appleby, Andrew Garwood-Gowers, Shih-Ning Then, and Melanie Jansen for commenting on an earlier draft.

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